

REFERENCES

- Abderahmene, A., Ellouz, A., Amor, D., Ajmi, M., Khalij, Y., Hamdouni, H., Sahtout, W., Azzabi, A., Omezzine, A., Achour, A., & Bouzlama, A. (2022). The pharmacogenetics of mycophenolate mofetil in Tunisian renal transplant patients. *Personalized Medicine*, *19*(5), 383–393. <https://doi.org/10.2217/pme-2021-0092>
- Abecassis, M., Bartlett, S. T., Collins, A. J., Davis, C. L., Delmonico, F. L., Friedewald, J. J., Hays, R., Howard, A., Jones, E., Leichtman, A. B., Merion, R. M., Metzger, R. A., Pradel, F., Schweitzer, E. J., Velez, R. L., & Gaston, R. S. (2008). Kidney Transplantation as Primary Therapy for End-Stage Renal Disease. *Clinical Journal of the American Society of Nephrology*, *3*(2), 471–480. <https://doi.org/10.2215/CJN.05021107>
- Alachkar, H., Mutonga, M., Kato, T., Kalluri, S., Kakuta, Y., Uemura, M., Imamura, R., Nonomura, N., Vujjini, V., Alasfar, S., Rabb, H., Nakamura, Y., & Alachkar, N. (2016). Quantitative Characterization of T-Cell Repertoire and Biomarkers in Kidney Transplant Rejection. *BMC Nephrology*, *17*(1), 181. <https://doi.org/10.1186/s12882-016-0395-3>
- Alasfar, S., Kodali, L., & Schinstock, C. A. (2023). Current Therapies in Kidney Transplant Rejection. *Journal of Clinical Medicine*, *12*(15), 4927. <https://doi.org/10.3390/jcm12154927>
- Alberts, B., Johnson, A., Lewis, J., Morgan, D., Raff, M., Roberts, K., & Walter, P. (2015). *Molecular Biology of The Cell* (Sixth edition). Garland Science.
- Alelign, T., Ahmed, M. M., Bobosha, K., Tadesse, Y., Howe, R., & Petros, B. (2018). Kidney Transplantation: The Challenge of Human Leukocyte Antigen and Its Therapeutic Strategies. *Journal of Immunology Research*, *2018*, 1–18. <https://doi.org/10.1155/2018/5986740>
- Aneesh, T. P., M, S. S., Jose, A., Chandran, L., & Zachariah, S. M. (2009). Pharmacogenomics: The Right Drug to the Right Person. *Journal of Clinical Medicine Research*. <https://doi.org/10.4021/jocmr2009.08.1255>
- Atcheson, B. A., Taylor, P. J., Mudge, D. W., Johnson, D. W., Hawley, C. M., Campbell, S. B., Isbel, N. M., Pillans, P. I., & Tett, S. E. (2005). Mycophenolic acid pharmacokinetics and related outcomes early after renal transplant. *British Journal of Clinical Pharmacology*, *59*(3), 271–280. <https://doi.org/10.1111/j.1365-2125.2004.02235.x>
- Avasare, R., Drexler, Y., Caster, D. J., Mitrofanova, A., & Jefferson, J. A. (2023). Management of Lupus Nephritis: New Treatments and Updated Guidelines. *Kidney360*, *4*(10), 1503–1511. <https://doi.org/10.34067/KID.0000000000000230>

- Balitbangkes. (2018). *Hasil Utama Riskesdas 2018*.
- Balla, A., & Chobanian, M. (2009). New-onset diabetes after transplantation: a review of recent literature. *Current Opinion in Organ Transplantation*, *14*(4), 375–379. <https://doi.org/10.1097/MOT.0b013e32832dbb98>
- Banasik, J. L., & Copstead, L.-E. C. (2019). *Pathophysiology* (6th edition). Elsevier.
- Barnes, M. R., & Breen, G. (2010). *Genetic Variation: Methods and Protocols* (M. R. Barnes & G. Breen, Eds.; Vol. 628). Humana Press. <https://doi.org/10.1007/978-1-60327-367-1>
- Barraclough, K. A., Lee, K. J., & Staatz, C. E. (2010a). Pharmacogenetic Influences on Mycophenolate Therapy. *Pharmacogenomics*, *11*(3), 369–390. <https://doi.org/10.2217/pgs.10.9>
- Barraclough, K. A., Lee, K. J., & Staatz, C. E. (2010b). Pharmacogenetic influences on mycophenolate therapy. *Pharmacogenomics*, *11*(3), 369–390. <https://doi.org/10.2217/pgs.10.9>
- Batalini, L. S., Castro, S. de O., G., C. G. R., Neitzke-Abreu, H. C., & L., M. S. da C. (2020). Evaluation of DNA Extraction Methods for Detection of Leishmania by Polymerase Chain Reaction. *American Journal of Molecular Biology*, *10*(04), 265–272. <https://doi.org/10.4236/ajmb.2020.104018>
- Bergan, S., Brunet, M., Hesselink, D. A., Johnson-Davis, K. L., Kunicki, P. K., Lemaitre, F., Marquet, P., Molinaro, M., Noceti, O., Pattanaik, S., Pawinski, T., Seger, C., Shipkova, M., Swen, J. J., van Gelder, T., Venkataramanan, R., Wieland, E., Woillard, J.-B., Zwart, T. C., ... Langman, L. J. (2021a). Personalized Therapy for Mycophenolate: Consensus Report by the International Association of Therapeutic Drug Monitoring and Clinical Toxicology. *Therapeutic Drug Monitoring*, *43*(2), 150–200. <https://doi.org/10.1097/FTD.0000000000000871>
- Bergan, S., Brunet, M., Hesselink, D. A., Johnson-Davis, K. L., Kunicki, P. K., Lemaitre, F., Marquet, P., Molinaro, M., Noceti, O., Pattanaik, S., Pawinski, T., Seger, C., Shipkova, M., Swen, J. J., van Gelder, T., Venkataramanan, R., Wieland, E., Woillard, J.-B., Zwart, T. C., ... Langman, L. J. (2021b). Personalized Therapy for Mycophenolate: Consensus Report by the International Association of Therapeutic Drug Monitoring and Clinical Toxicology. *Therapeutic Drug Monitoring*, *43*(2), 150–200. <https://doi.org/10.1097/FTD.0000000000000871>
- Bertino, J. S., Kashuba, A. D. M., Ma, J. D., Fuhr, U., & DeVane, C. L. (2013). *Pharmacogenomics: An Introduction and Clinical Perspective*. McGraw-Hill.
- Betonico, G. N., Abudd-Filho, M., Goloni-Bertollo, E. M., & Pavarino-Bertelli, E. (2008). Pharmacogenetics of mycophenolate mofetil: a promising different approach to tailoring immunosuppression? *Journal of Nephrology*, *21*(4), 503–509.

- Bioneer. (2022). *Material Safety Data Sheet: GB Buffer*.
https://eng.bioneer.com/literatures/msds/prep/MSDS_AccuPrep_Genomic_DNA_Extraction_Kit_GB_Buffer_EN_ver.2.pdf
- Bouatou, Y., Viglietti, D., Pievani, D., Louis, K., Duong Van Huyen, J.-P., Rabant, M., Aubert, O., Taupin, J.-L., Glotz, D., Legendre, C., Loupy, A., & Lefaucheur, C. (2019). Response to Treatment and Long-Term Outcomes in Kidney Transplant Recipients with Acute T Cell–Mediated Rejection. *American Journal of Transplantation*, 19(7), 1972–1988. <https://doi.org/10.1111/ajt.15299>
- BPS. (2012). *Population of Indonesia: Result of Indonesia Population Census 2010*. Badan Pusat Statistik (Statistics Indonesia).
- Brooker, R. J. (2018). *Genetics: Analysis & Principles* (Sixth edition). McGraw-Hill Education.
- Brunton, L. S., & Knollmann, B. C. (2023). *Goodman and Gillman's The Pharmacological Basis Of Therapeutics* (Fourteenth Edition). McGraw Hill. <https://ebooksmedicine.net/>
- Capriotti, T., & Frizzel, J. P. (2016). *Pathophysiology Introductory Concepts and Clinical Perspectives*. F.A. Davis Company. www.DavisAdvantage.com
- Capriotti, T., & Frizzell, J. P. (2016). *Pathophysiology: Introductory Concepts and Clinical Perspectives*. F.A. Davis Company.
- Chandran, S., & Mannon, R. B. (2022). T Cell–Mediated Rejection in Kidney Transplant Recipients: The end(point) is Also The Beginning. *American Journal of Transplantation*, 22(3), 683–684. <https://doi.org/10.1111/ajt.16964>
- Chariyavilaskul, P., Phaisal, W., Kittanamongkolchai, W., Rukrung, C., Anutrakulchai, S., & Avihingsanon, Y. (2022). Pharmacokinetics and Pharmacodynamics Profiles of Enteric-Coated Mycophenolate Sodium in Female Patients with Difficult-to-Treat Lupus Nephritis. *Clinical and Translational Science*, 15(7), 1776–1786. <https://doi.org/10.1111/cts.13295>
- Cheng, L., Yao, P., Weng, B., Yang, M., & Wang, Q. (2022). Meta-analysis of the associations of IMPDH and UGT1A9 polymorphisms with rejection in kidney transplant recipients taking mycophenolic acid. *European Journal of Clinical Pharmacology*, 78(8), 1227–1238. <https://doi.org/10.1007/s00228-022-03311-4>
- Cilião, H. L., Camargo-Godoy, R. B. O., Souza, M. F. de, Zanuto, A., Delfino, V. D. A., & Cólus, I. M. de S. (2018). Polymorphisms in IMPDH2, UGT2B7, and CES2 Genes Influence The Risk of Graft Rejection in Kidney Transplant Recipients Taking Mycophenolate Mofetil. *Mutation Research/Genetic Toxicology and Environmental Mutagenesis*, 836, 97–102. <https://doi.org/10.1016/j.mrgentox.2018.06.008>

- Coffman, T. M., Falk, R. J., Molitoris, B. A., Neilson, E. G., & Schrier, R. W. (2013). *Schrier's Diseases of The Kidney Volume II* (9th ed). Wolters Kluwer Health/Lippincott Williams & Wilkins.
- Corrêa, R. R. M., Machado, J. R., da Silva, M. V., Helmo, F. R., Guimarães, C. S. O., Rocha, L. P., Faleiros, A. C. G., & dos Reis, M. A. (2013). The Importance of C4d in Biopsies of Kidney Transplant Recipients. *Clinical and Developmental Immunology*, 2013, 1–8. <https://doi.org/10.1155/2013/678180>
- Dave, V., Polkinghorne, K. R., Leong, K. G., Kanellis, J., & Mulley, W. R. (2020). Initial mycophenolate dose in tacrolimus treated renal transplant recipients, a cohort study comparing leukopaenia, rejection and long-term graft function. *Scientific Reports*, 10(1), 19379. <https://doi.org/10.1038/s41598-020-76379-6>
- DiPiro, J. T., Talbert, R. L., Yee, G. C., Matzke, G. R., Wells, B. G., & Posey, L. M. (2017). *Pharmacotherapy A Pathophysiologic Approach* (10th Edition). McGraw-Hill.
- Doi, Y., Kitayama, H., Yamada, M., & Miyama, Y. (2019). Severe Complications from an Unexpectedly High Serum Mycophenolic Acid Concentration in a Patient with Renal Failure Secondary to Lupus Nephritis: A Case Report. *Case Reports in Nephrology and Dialysis*, 9(2), 72–78. <https://doi.org/10.1159/000500516>
- Eide, I. A., Halden, T. A. S., Hartmann, A., Dahle, D. O., Åsberg, A., & Jenssen, T. (2017). Associations Between Posttransplantation Diabetes Mellitus and Renal Graft Survival. *Transplantation*, 101(6), 1282–1289. <https://doi.org/10.1097/TP.0000000000001259>
- Elston, R. C. (2017). *Statistical Human Genetics* (Vol. 1666). Springer New York. <https://doi.org/10.1007/978-1-4939-7274-6>
- Etxebarria, A., Díez-Martín, E., Astigarraga, E., & Barreda-Gómez, G. (2022). Role of the Immune System in Renal Transplantation, Types of Response, Technical Approaches and Current Challenges. *Immuno*, 2(4), 548–570. <https://doi.org/10.3390/immuno2040035>
- Farida, L. S., Thaha, M., & Susanti, D. (2018). Characteristics of Patients with End-Stage Renal Disease at Dialysis Unit Dr. Soetomo General Hospital Surabaya. *Biomolecular and Health Science Journal*, 1(2), 97. <https://doi.org/10.20473/bhsj.v1i2.9400>
- Farjadian, S. (2012). The significance of HLA typing in transplantation. *Journal of Nephropathology*, 1(3), 160–161. <https://doi.org/10.5812/nephropathol.8112>
- Fatchiyah, Arumingtyas, E. L., Widyarti, S., & Rahayu, S. (2011). *Biologi Molekular: Prinsip Dasar Analisis*. Erlangga.

- Feehally, J., Flöge, J., Tonelli, M., & Johnson, R. J. (2019). *Comprehensive Clinical Nephrology* (Sixth edition). Elsevier.
- Francis Lam, Y. W., & Scott, S. A. (2019). *Pharmacogenomics: Challenges and Opportunities in Therapeutic Implementation*.
- Gelder, T. van. (2005). Mycophenolate Mofetil: How to Further Improve Using an Already Successful Drug? *American Journal of Transplantation*, 5(2), 199–200. <https://doi.org/10.1111/j.1600-6143.2005.00793.x>
- Geneaid. (2017). *Genomic DNA Mini Kit (Blood/Cultured Cell)*. <https://www.geneaid.com/data/files/1605601647444535985.pdf>
- Gensburger, O., Van Schaik, R. H. N., Picard, N., Le Meur, Y., Rousseau, A., Woillard, J.-B., Van Gelder, T., & Marquet, P. (2010a). Polymorphisms in type I and II inosine monophosphate dehydrogenase genes and association with clinical outcome in patients on mycophenolate mofetil. *Pharmacogenetics and Genomics*, 20(9), 537–543. <https://doi.org/10.1097/FPC.0b013e32833d8cf5>
- Gensburger, O., Van Schaik, R. H. N., Picard, N., Le Meur, Y., Rousseau, A., Woillard, J.-B., Van Gelder, T., & Marquet, P. (2010b). Polymorphisms in type I and II inosine monophosphate dehydrogenase genes and association with clinical outcome in patients on mycophenolate mofetil. *Pharmacogenetics and Genomics*, 20(9), 537–543. <https://doi.org/10.1097/FPC.0b013e32833d8cf5>
- Genvigir, F. D. V., Cerda, A., Hirata, T. D. C., Hirata, M. H., & Hirata, R. D. C. (2020). Mycophenolic Acid Pharmacogenomics in Kidney Transplantation. *Journal of Translational Genetics and Genomics*. <https://doi.org/10.20517/jtgg.2020.37>
- Ghatak, S., Muthukumaran, R. B., & Nachimuthu, S. K. (2013). A Simple Method of Genomic DNA Extraction from Human Samples for PCR-RFLP Analysis. *Journal of Biomolecular Techniques : JBT*, jbt.13-2404-001. <https://doi.org/10.7171/jbt.13-2404-001>
- Gilbert, S. J., Weiner, D. E., Bomback, A. S., Perazella, M. A., & Tonelli, M. (2018). *National Kidney Foundation's Primer on Kidney Disease* (Seventh Edition). Elsevier.
- Glander, P., Sommerer, C., Arns, W., Ariatbar, T., Kramer, S., Vogel, E.-M., Shipkova, M., Fischer, W., Zeier, M., & Budde, K. (2010). Pharmacokinetics and Pharmacodynamics of Intensified versus Standard Dosing of Mycophenolate Sodium in Renal Transplant Patients. *Clinical Journal of the American Society of Nephrology*, 5(3), 503–511. <https://doi.org/10.2215/CJN.06050809>
- Gramlick, M. E., Trevillian, P., Palazzi, K. L., & Heer, M. K. (2022). Time to Move on: HLA Matching Should Be Reconsidered in Modern Deceased Donor Kidney

- Allocation. *Transplantation Direct*, 8(3), e1295.
<https://doi.org/10.1097/TXD.0000000000001295>
- Griffiths, A. J. F., Wessler, S. R., Carroll, S. B., & Doebley, J. (2012). *Introduction to Genetic Analysis* (Tenth Edition). W.H Freeman and Company.
- Grinyó, J., Vanrenterghem, Y., Nashan, B., Vincenti, F., Ekberg, H., Lindpaintner, K., Rashford, M., Nasmyth-Miller, C., Voulgari, A., Spleiss, O., Truman, M., & Essioux, L. (2008). Association of four DNA polymorphisms with acute rejection after kidney transplantation. *Transplant International*, 21(9), 879–891.
<https://doi.org/10.1111/j.1432-2277.2008.00679.x>
- Grossman, S., & Porth, C. (2014). *Porth's Pathophysiology: Concepts of Altered Health States* (9th edition). Wolters Kluwer Health-Lippincott Williams & Wilkins.
- Gusev, E., Solomatina, L., Zhuravleva, Y., & Sarapultsev, A. (2021). The Pathogenesis of End-Stage Renal Disease from the Standpoint of the Theory of General Pathological Processes of Inflammation. *International Journal of Molecular Sciences*, 22(21), 11453. <https://doi.org/10.3390/ijms222111453>
- Hardinger, K. L., Hebbar, S., Bloomer, T., & Murillo, D. (2008). Adverse drug reaction driven immunosuppressive drug manipulations: a single-center comparison of enteric-coated mycophenolate sodium vs. mycophenolate mofetil. *Clinical Transplantation*, 22(5), 555–561. <https://doi.org/10.1111/j.1399-0012.2008.00820.x>
- Helanterä, I., & Mengel, M. (2022). Revisiting Acute T cell–Mediated Rejection in Kidney Allografts. *American Journal of Transplantation*, 22(3), 681–682. <https://doi.org/10.1111/ajt.16923>
- Hill, N. R., Fatoba, S. T., Oke, J. L., Hirst, J. A., O'Callaghan, C. A., Lasserson, D. S., & Hobbs, F. D. R. (2016). Global prevalence of chronic kidney disease - A systematic review and meta-analysis. In *PLoS ONE* (Vol. 11, Issue 7). Public Library of Science. <https://doi.org/10.1371/journal.pone.0158765>
- Hirunsatitpron, P., Hanprasertpong, N., Noppakun, K., Pruksakorn, D., Teekachunhatean, S., & Koonrunsesomboon, N. (2022). Mycophenolic acid and cancer risk in solid organ transplant recipients: Systematic review and meta-analysis. *British Journal of Clinical Pharmacology*, 88(2), 476–489. <https://doi.org/10.1111/bcp.14979>
- Hricik, D. E. (2015). Transplant Immunology and Immunosuppression: Core Curriculum 2015. *American Journal of Kidney Diseases*, 65(6), 956–966. <https://doi.org/10.1053/j.ajkd.2015.01.026>
- Huether, S. E., Mccance, K. L., & Brashers, V. L. (2020). *Understanding Pathophysiology* (7th ed.). Elsevier.

- Indonesian Renal Registry. (2020). *13th Annual Report of Indonesian Renal Registry 2020*. <https://www.indonesianrenalregistry.org/data/IRR%202020.pdf>
- International Society of Nephrology. (2023). *ISN-Global Kidney Health Atlas*. International Society of Nephrology.
- Johnston, A., He, X., & Holt, D. W. (2006). Bioequivalence of Enteric-Coated Mycophenolate Sodium and Mycophenolate Mofetil: A Meta-Analysis of Three Studies in Stable Renal Transplant Recipients. *Transplantation*, *82*(11), 1413–1418. <https://doi.org/10.1097/01.tp.0000242137.68863.89>
- Kalman, L., Agúndez, J., Appell, M. L., Black, J., Bell, G., Boukouvala, S., Bruckner, C., Bruford, E., Caudle, K., Coulthard, S., Daly, A., Tredici, A. Del, den Dunnen, J., Drozda, K., Everts, R., Flockhart, D., Freimuth, R., Gaedigk, A., Hachad, H., ... Zanger, U. (2016). Pharmacogenetic allele nomenclature: International workgroup recommendations for test result reporting. *Clinical Pharmacology & Therapeutics*, *99*(2), 172–185. <https://doi.org/10.1002/cpt.280>
- Kanbay, M., Siriopol, D., Guldan, M., Ozbek, L., Topcu, A. U., Siriopol, I., & Tuttle, K. (2025). Prognostic impact of post-transplant diabetes mellitus in kidney allograft recipients: a meta-analysis. *Nephrology Dialysis Transplantation*, *40*(3), 554–576. <https://doi.org/10.1093/ndt/gfae185>
- Karnell, J. L., Karnell, F. G., Stephens, G. L., Rajan, B., Morehouse, C., Li, Y., Swerdlow, B., Wilson, M., Goldbach-Mansky, R., Groves, C., Coyle, A. J., Herbst, R., & Ettinger, R. (2011). Mycophenolic Acid Differentially Impacts B Cell Function Depending on the Stage of Differentiation. *The Journal of Immunology*, *187*(7), 3603–3612. <https://doi.org/10.4049/jimmunol.1003319>
- Karp, G. (2004). *Cell and Molecular Biology : Concept and Experiments*. Wiley.
- Kato, S., Chmielewski, M., Honda, H., Pecoits-Filho, R., Matsuo, S., Yuzawa, Y., Tranaeus, A., Stenvinkel, P., & Lindholm, B. (2008). Aspects of Immune Dysfunction in End-stage Renal Disease. *Clinical Journal of the American Society of Nephrology*, *3*(5), 1526–1533. <https://doi.org/10.2215/CJN.00950208>
- Katz-Greenberg, G., & Shah, S. (2022). Sex and Gender Differences in Kidney Transplantation. *Seminars in Nephrology*, *42*(2), 219–229. <https://doi.org/10.1016/j.semnephrol.2022.04.011>
- Katzung, B. G. (2018). *Basic & clinical pharmacology* (14th ed.). McGraw-Hill Education.
- Kemenkes RI. (2023). *Pedoman Nasional Pelayanan Kedokteran Tata Laksana Ginjal Kronik*. Kementerian Kesehatan Republik Indonesia.
- Khan, M. A., Hanna, A., Sridhara, S., Chaudhari, H., Me, H. M., Attieh, R. M., & Abu Jawdeh, B. G. (2025). Maintenance Immunosuppression in Kidney Transplantation:

- A Review of the Current Status and Future Directions. *Journal of Clinical Medicine*, 14(6), 1821. <https://doi.org/10.3390/jcm14061821>
- Kidney Disease: Improving Global Outcomes (KDIGO) Transplant Work Group. (2009). KDIGO Clinical Practice Guideline for The Care of Kidney Transplant Recipients. *American Journal of Transplantation*, 9(Suppl 3), S1–S157.
- Kimmel, P. L., & Rosenberg, M. E. (2020). *Chronic Renal Disease* (Second edition). Academic Press/Elsevier.
- Knechtle, S. J., Marson, L. P., & Morris, P. J. (2020). *Kidney Transplantation: Principles and Practice* (Eighth edition). Elsevier.
- Koshy, L., Anju, A. L., Harikrishnan, S., Kutty, V. R., Jissa, V. T., Kurikesu, I., Jayachandran, P., Jayakumaran Nair, A., Gangaprasad, A., Nair, G. M., & Sudhakaran, P. R. (2017). Evaluating genomic DNA extraction methods from human whole blood using endpoint and real-time PCR assays. *Molecular Biology Reports*, 44(1), 97–108. <https://doi.org/10.1007/s11033-016-4085-9>
- Kovac, J., Rolon, M. L., Naum, M., & Lampel, K. A. (2022). DNA-Based Assays. In *Encyclopedia of Dairy Sciences* (pp. 356–362). Elsevier. <https://doi.org/10.1016/B978-0-12-818766-1.00157-4>
- Kwon, H., Kim, Y. H., Ko, Y., Lim, S. J., Jung, J. H., Baek, C. H., Kim, H., Park, S.-K., Shin, S., & Cho, Y.-P. (2021). Pure T-Cell Mediated Rejection Following Kidney Transplant According to Response to Treatment. *PLOS ONE*, 16(9), e0256898. <https://doi.org/10.1371/journal.pone.0256898>
- Lamba, V., Sangkuhl, K., Sanghavi, K., Fish, A., Altman, R. B., & Klein, T. E. (2014). PharmGKB Summary: Mycophenolic Acid Pathway. *Pharmacogenetics and Genomics*, 24(1), 73–79. <https://doi.org/10.1097/FPC.0000000000000010>
- Langman, L. J., & Dasgupta, A. (2012). *Pharmacogenomics in clinical therapeutics*. Wiley-Blackwell.
- Lee, J. R., & Muthukumar, T. (2012). Immunologic Concepts in Kidney Transplantation. In *Current Concepts in Kidney Transplantation*. InTech. <https://doi.org/10.5772/53798>
- Lertdumrongluk, P., Somparn, P., Kittanamongkolchai, W., Traitanon, O., Vadcharavivad, S., & Avihingsanon, Y. (2010). Pharmacokinetics of mycophenolic acid in severe lupus nephritis. *Kidney International*, 78(4), 389–395. <https://doi.org/10.1038/ki.2010.170>
- López-Oliva, M. O., Flores, J., Madero, R., Escuin, F., Santana, M. J., Bellón, T., Selgas, R., & Jiménez, C. (2017). Cytomegalovirus infection after kidney transplantation and long-term graft loss. *Nefrología (English Edition)*, 37(5), 515–525. <https://doi.org/10.1016/j.nefro.2016.11.018>

- Lusco, M. A., Fogo, A. B., Najafian, B., & Alpers, C. E. (2016). AJKD Atlas of Renal Pathology: Acute T-Cell-Mediated Rejection. *American Journal of Kidney Diseases*, 67(5), e29–e30. <https://doi.org/10.1053/j.ajkd.2016.03.004>
- McCune, J. S., Storer, B., Thomas, S., McKiernan, J., Gupta, R., & Sandmaier, B. M. (2018). Inosine Monophosphate Dehydrogenase Pharmacogenetics in Hematopoietic Cell Transplantation Patients. *Biology of Blood and Marrow Transplantation*, 24(9), 1802–1807. <https://doi.org/10.1016/j.bbmt.2018.04.006>
- Melo, Z., Ruiz-Pacheco, J. A., Mendoza-Cerpa, C. A., & Echavarría, R. (2018). Immunopathology of Kidney Transplantation. In *Pathophysiology - Altered Physiological States*. InTech. <https://doi.org/10.5772/intechopen.70596>
- Mok, C. C., Teng, Y. K. O., Saxena, R., & Tanaka, Y. (2023). Treatment of lupus nephritis: consensus, evidence and perspectives. *Nature Reviews Rheumatology*, 19(4), 227–238. <https://doi.org/10.1038/s41584-023-00925-5>
- Morisky, D. E., Green, L. W., & Levine, D. M. (1986). Concurrent and Predictive Validity of a Self-reported Measure of Medication Adherence. *Medical Care*, 24(1), 67–74. <https://doi.org/10.1097/00005650-198601000-00007>
- Muntean, A., & Lucan, M. (2013). Immunosuppression in Kidney Transplantation. *Clujul Medical (1957)*, 86(3), 177–180.
- National Center for Biotechnology Information. (2017). *Restriction Fragment Length Polymorphism (RFLP)*. <https://www.ncbi.nlm.nih.gov/probe/docs/techrflp/>
- NCBI. (2024). *IMPDH2 inosine monophosphate dehydrogenase 2 [Homo sapiens (human)]*. <https://www.ncbi.nlm.nih.gov/gene/3615>
- Ngamvichchukorn, T., Ruengorn, C., Noppakun, K., Thavorn, K., Hutton, B., Sood, M. M., Knoll, G. A., & Nochaiwong, S. (2022). Association Between Pretransplant Dialysis Modality and Kidney Transplant Outcomes. *JAMA Network Open*, 5(10), e2237580. <https://doi.org/10.1001/jamanetworkopen.2022.37580>
- Nolan, C. J., Damm, P., & Prentki, M. (2011). Type 2 diabetes across generations: from pathophysiology to prevention and management. *The Lancet*, 378(9786), 169–181. [https://doi.org/10.1016/S0140-6736\(11\)60614-4](https://doi.org/10.1016/S0140-6736(11)60614-4)
- O'Neill, A. G., Burrell, A. L., Zech, M., Elpeleg, O., Harel, T., Edvardson, S., Mor-Shaked, H., Rippert, A. L., Nomakuchi, T., Izumi, K., & Kollman, J. M. (2023). Neurodevelopmental disorder mutations in the purine biosynthetic enzyme IMPDH2 disrupt its allosteric regulation. *Journal of Biological Chemistry*, 299(8), 105012. <https://doi.org/10.1016/j.jbc.2023.105012>
- Ossman, R., Jamme, M., Moulin, B., Legendre, C., Morelon, E., Frimat, L., Hourmant, M., Durrbach, A., Malvezzi, P., Rostaing, L., Luc Taupin, J., Mesnard, L., & Rondeau, E. (2020). Immunosuppression and Graft Rejection in Living-related

- HLA-identical Renal Transplantation: The RADOVFULL Study. *Transplantation*, 104(6), 1256–1262. <https://doi.org/10.1097/TP.0000000000002937>
- Padmanabhan, S. (2014). *Handbook of Pharmacogenomics and Stratified Medicine*. Academic Press.
- Palanisamy, A. P., Schiltz, C. E., Pilch, N. A., Hunt, K. J., Nadig, S. N., Dowden, J. E., McGillicuddy, J. W., Baliga, P. K., Chavin, K. D., & Taber, D. J. (2015). Cardiovascular risk factors contribute to disparities in graft outcomes in African American renal transplant recipients: A retrospective analysis. *Blood Pressure*, 24(1), 14–22. <https://doi.org/10.3109/08037051.2014.934527>
- Pandey, J., Sigdel, M. R., Nepali, R., Kafle, M. P., Shrestha, M., & Shah, D. S. (2025). WCN25-4313 ASSOCIATION BETWEEN TACROLIMUS TROUGH LEVEL AND INCIDENCE OF NEW ONSET DIABETES MELLITUS AFTER KIDNEY TRANSPLANTATION. *Kidney International Reports*, 10(2), S554. <https://doi.org/10.1016/j.ekir.2024.11.992>
- Pazik, J., Ołdak, M., Podgórska, M., Lewandowski, Z., Sitarek, E., Płoski, R., Szmidt, J., Chmura, A., Durlik, M., & Malejczyk, J. (2011). Lymphocyte Counts in Kidney Allograft Recipients Are Associated With IMPDH2 3757T>C Gene Polymorphism. *Transplantation Proceedings*, 43(8), 2943–2945. <https://doi.org/10.1016/j.transproceed.2011.08.037>
- Penezić, L., Nađ-Škegro, S., Hadžavdić, A., Ganoci, L., Kaštelan, Ž., Trkulja, V., & Božina, N. (2024). Inosine monophosphate dehydrogenase type 2 polymorphism IMPDH2 3757T>C (rs11706052) and 12-month evolution of the graft function in renal transplant recipients on mycophenolate-based immunosuppression. *The Pharmacogenomics Journal*, 24(3), 15. <https://doi.org/10.1038/s41397-024-00335-0>
- Perhimpunan Nefrologi Indonesia. (2013). *Konsensus Transplantasi Ginjal Perhimpunan Nefrologi Indonesia (PERNEFRI) 2013*. Perhimpunan Nefrologi Indonesia (PERNEFRI).
- PharmGKB. (2025). *rs11706052*. <https://www.pharmgkb.org/variant/PA166156443/overview>
- Phillips, B. L., & Callaghan, C. (2023). The Immunology of Organ Transplantation. *Surgery (Oxford)*, 41(9), 543–551. <https://doi.org/10.1016/j.mpsur.2023.06.004>
- Philogene, M. C., & Brennan, D. C. (2023). *Kidney transplantation in adults: HLA matching and outcomes*. <https://www.uptodate.com/contents/kidney-transplantation-in-adults-hla-matching-and-outcomes#H758262768>
- Pierce, B. A. (2020). *Genetics A Conceptual Approach* (Seventh Edition). Macmillan International Higher Education .

- Popović, L., & Bulum, T. (2025). New Onset Diabetes After Organ Transplantation: Risk Factors, Treatment, and Consequences. *Diagnostics*, *15*(3), 284. <https://doi.org/10.3390/diagnostics15030284>
- Rajendiran, A. K., Jeyachandran, D., Gopalakrishnan, N., Arumugam, V., Thanigachalam, D., & Ramanathan, S. (2021). Cytomegalovirus Infection and Kidney Transplantation- A Retrospective Study of Risk Factors and Long-Term Clinical Outcome. *Indian Journal of Transplantation*, *15*(2), 125–130. https://doi.org/10.4103/ijot.ijot_116_20
- Sawinski, D., & Poggio, E. D. (2021). Introduction to Kidney Transplantation: Long-Term Management Challenges. *Clinical Journal of the American Society of Nephrology*, *16*(8), 1262–1263. <https://doi.org/10.2215/CJN.13440820>
- Shah, S., Harwood, S. M., Döhler, B., Opelz, G., & Yaqoob, M. M. (2012). Inosine Monophosphate Dehydrogenase Polymorphisms and Renal Allograft Outcome. *Transplantation*, *94*(5), 486–491. <https://doi.org/10.1097/TP.0b013e31825b7654>
- Shahbazi, F., Ranjbaran, M., Karami-far, S., Soori, H., & Manesh, H. (2015). Graft survival rate of renal transplantation during a period of 10 years in Iran. *Journal of Research in Medical Sciences*, *20*(11), 1046. <https://doi.org/10.4103/1735-1995.172814>
- Shaw, L. M., Korecka, M., Venkataramanan, R., Goldberg, L., Bloom, R., & Brayman, K. L. (2003). Mycophenolic Acid Pharmacodynamics and Pharmacokinetics Provide a Basis for Rational Monitoring Strategies. *American Journal of Transplantation*, *3*(5), 534–542. <https://doi.org/10.1034/j.1600-6143.2003.00079.x>
- Shrestha, B. M. (2013). Immunology for Renal Transplantation: A Review. *Journal of Transplantation Technologies & Research*, *04*(01). <https://doi.org/10.4172/2161-0991.1000130>
- Snustad, D. P., & Simmons, M. J. (2012). *Principles of Genetics* (6th ed). Wiley.
- Sombogaard, F. (2010). *Pharmacodynamic Monitoring of Inosine Monophosphate Dehydrogenase Activity: A Basis for Optimized and Individualized Mycophenolate Mofetil Therapy*. Erasmus University Rotterdam.
- Sombogaard, F., van Schaik, R. H. N., Mathot, R. A., Budde, K., van der Werf, M., Vulto, A. G., Weimar, W., Glander, P., Essioux, L., & van Gelder, T. (2009). Interpatient variability in IMPDH activity in MMF-treated renal transplant patients is correlated with IMPDH type II 3757T>C polymorphism. *Pharmacogenetics and Genomics*, *19*(8), 626–634. <https://doi.org/10.1097/FPC.0b013e32832f5f1b>
- Tambur, A. R., Kosmoliaptsis, V., Claas, F. H. J., Mannon, R. B., Nickerson, P., & Naesens, M. (2021). Significance of HLA-DQ in kidney transplantation: time to reevaluate human leukocyte antigen–matching priorities to improve transplant

- outcomes? An expert review and recommendations. *Kidney International*, 100(5), 1012–1022. <https://doi.org/10.1016/j.kint.2021.06.026>
- ThermoFisher. (2025). *Restriction Fragment Length Polymorphism (RFLP) Analysis*. <https://www.thermofisher.com/id/en/home/life-science/sequencing/fragment-analysis/restriction-fragment-length-polymorphism-rflp-analysis.html>
- Thongprayoon, C., Hansrivijit, P., Leeaphorn, N., Acharya, P., Torres-Ortiz, A., Kaewput, W., Kovvuru, K., Kanduri, S., Bathini, T., & Cheungpasitporn, W. (2020). Recent Advances and Clinical Outcomes of Kidney Transplantation. *Journal of Clinical Medicine*, 9(4), 1193. <https://doi.org/10.3390/jcm9041193>
- United States Renal Data System. (2023). *2023 USRDS Annual Data Report: Epidemiology of Kidney Disease in The United States*.
- Wallace, D. J., & Hahn, B. H. (2019). *Dubois' Lupus Erythematosus and Related Syndromes* (Ninth Edition). Elsevier.
- Wang, J., Zeevi, A., Webber, S., Girnita, D. M., Addonizio, L., Selby, R., Hutchinson, I. V., & Burckart, G. J. (2007). A novel variant L263F in human inosine 5'-monophosphate dehydrogenase 2 is associated with diminished enzyme activity. *Pharmacogenetics and Genomics*, 17(4), 283–290. <https://doi.org/10.1097/FPC.0b013e328012b8cf>
- Watson, J. D., Baker, T. A., Bell, S. P., Gann, A., Levine, M., & Losick, R. (2014). *Molecular Biology of The Gene* (Seventh edition). Pearson.
- Winnicki, W., Fichtenbaum, A., Mitulović, G., Herkner, H., Regele, F., Baier, M., Zelzer, S., Wagner, L., & Sengoelge, G. (2022). Individualization of Mycophenolic Acid Therapy through Pharmacogenetic, Pharmacokinetic and Pharmacodynamic Testing. *Biomedicines*, 10(11), 2882. <https://doi.org/10.3390/biomedicines10112882>
- Winnicki, W., Weigel, G., Sunder-Plassmann, G., Bajari, T., Winter, B., Herkner, H., & Sengoelge, G. (2010). An inosine 5'-monophosphate dehydrogenase 2 single-nucleotide polymorphism impairs the effect of mycophenolic acid. *The Pharmacogenomics Journal*, 10(1), 70–76. <https://doi.org/10.1038/tpj.2009.43>
- Woillard, J.-B., Picard, N., Thierry, A., Touchard, G., & Marquet, P. (2014). Associations between polymorphisms in target, metabolism, or transport proteins of mycophenolate sodium and therapeutic or adverse effects in kidney transplant patients. *Pharmacogenetics and Genomics*, 24(5), 256–262. <https://doi.org/10.1097/FPC.0000000000000045>
- Wouk, N. (2021). End-Stage Renal Disease: Medical Management. *American Family Physician*, 104(5). www.aafp.org/afp

- Wu, T., Peng, Y., Pelleymounter, L., Moon, I., Eckloff, B., Wieben, E., Yee, V., & Weinshilboum, R. (2010). Pharmacogenetics of the mycophenolic acid targets inosine monophosphate dehydrogenases IMPDH1 and IMPDH2: gene sequence variation and functional genomics. *British Journal of Pharmacology*, *161*(7), 1584–1598. <https://doi.org/10.1111/j.1476-5381.2010.00987.x>
- Xu, H., Ma, H., Zha, L., Li, Q., Yang, G., Pan, H., Fei, X., Xu, X., Xing, C., & Zhang, L. (2020). IMPDH2 promotes cell proliferation and epithelial-mesenchymal transition of non-small cell lung cancer by activating the Wnt/β-catenin signaling pathway. *Oncology Letters*, *20*(5), 1–1. <https://doi.org/10.3892/ol.2020.12082>
- Yamamoto, I., Kawabe, M., Hayashi, A., Kobayashi, A., Yamamoto, H., & Yokoo, T. (2023). Challenges Posed by the Banff Classification: Diagnosis and Treatment of Chronic Active T-Cell-Mediated Rejection. *Nephron*, *147*(Suppl. 1), 74–79. <https://doi.org/10.1159/000530158>
- Yoo, K. D., Kim, C. T., Kim, M.-H., Noh, J., Kim, G., Kim, H., An, J. N., Park, J. Y., Cho, H., Kim, K. H., Kim, H., Ryu, D.-R., Kim, D. K., Lim, C. S., Kim, Y. S., & Lee, J. P. (2016). Superior Outcomes of Kidney Transplantation Compared with Dialysis. *Medicine*, *95*(33), e4352. <https://doi.org/10.1097/MD.0000000000004352>
- Yu, A. S. L., Chertow, G. M., Luyckx, V. A., Marsden, P. A., Skorecki, K., Taal, M. W., & Wasser, W. G. (2020). *Brenner & Rector's The Kidney* (Eleventh Edition). Elsevier.
- Zdanowicz, M. M. (2017). *Concepts in Pharmacogenomics: Fundamentals and Therapeutic Applications in Personalized Medicine*. ASHP Publications.
- Zolezzi, M. (2005). Mycophenolate Sodium versus Mycophenolate Mofetil: A Review of Their Comparative Features. *Saudi Journal of Kidney Diseases and Transplantation*, *16*(2). https://journals.lww.com/sjkd/fulltext/2005/16020/mycophenolate_sodium_versus_mycophenolate_mofetil_2.aspx